

A.3.6 SUN-EARTH CONNECTION INSTRUMENT DEVELOPMENT

1. Scope of Program

The Sun-Earth Connection (SEC) Instrument Development (SECID) program supports the development of spacecraft-based instrument technologies that shows promise for use in scientific investigations on future SEC missions. All NASA research proposals are expected to demonstrate relevance to NASA Goals and Research Focus Area's (RFA's) as stated in the latest version of its Strategic Plan (follow links from the Web site <http://spacescience.nasa.gov/>); see also the discussion in Section 1 of the Summary of Solicitation of this NRA. In the case of the SECID program, proposals are expected to address one or more of the RFA's under Goal II, SEC theme science objectives, namely, (1) Understand the changing flow of energy and matter throughout the Sun, heliosphere, and planetary environments, and (2) Explore the fundamental physical processes of space plasma systems. These RFA's are:

- Goal II: SEC 1.a: Understand the structure and dynamics of the Sun and solar wind and the origins of magnetic variability
- Goal II: SEC 1.b: Determine the evolution and the heliosphere and its interaction with the galaxy
- Goal II: SEC 1.c: Understand the response of magnetospheres and atmospheres to external and internal drivers
- Goal II: SEC 2.a: Discover how magnetic fields are created and evolve and how charged particles are accelerated, and
- Goal II: SEC 2.b: Understand coupling across multiple scale lengths and its generality in plasma systems.

The appropriate place for this statement of relevancy is in the introduction to the proposal's "Scientific/Technical/Management" section (see Section 2.3.5 in the *Guidebook for Proposers*). The index numbers in this table may be used to identify a specific RFA, for example, "Goal I, Sun-Earth Connection Theme, RFA 1(c)" or "Goal II, Astronomical Search for Origins, RFA 3(b)."

The goal of the program is to define and develop scientific instruments and/or components of such instruments to the point where complete instruments may be proposed in response to future announcements of flight opportunity without additional extensive technology development. Note that the instrument technology development proposed through this program must address specific scientific objectives of candidate SEC future missions. Wholly new measurement concepts may be proposed, as well as methods that may significantly improve the performance of existing instruments and/or the development of technologies that enable the packaging of multiple instruments in order to minimize the need for spacecraft resources (e.g., volume, power, telemetry, and mass).

Instrument definition and development studies may be proposed that take place at several stages, ranging from feasibility studies of entirely new instruments, to conceptual design, to laboratory breadboarding of critical components and/or complete instruments. For immature or very complex new instruments, proposers initially may choose to propose

only to define or develop only the most risky components by way of a proof-of-concept, then to follow with proposals for the next stage. However, in all cases of component-only development, one or more likely scenarios for possible follow-on instrument development should also be described. Regardless of the type of proposed effort, the scientific objectives of those instruments and future candidate missions must be discussed in the proposal; proposals that do not demonstrate how their development studies could be used to attack contemporary issues in the SEC sciences will be considered nonresponsive to this solicitation.

Proposals for the development of new instruments for missions already selected for flight or selected for Explorer Phase A study and/or development are not appropriate for this SECID program and will be returned without review.

2. SEC Future Missions

Owing to the immediacy and high priority of certain key flight mission opportunities, only proposals for instrument definition and development for the following future mission programs will be considered for funding through this year's SECID program.

- Explorer Program

The Explorer program seeks to provide a continuing opportunity for quickly implemented space flight missions that conduct focused investigations that complement major flight missions, prove and explore new scientific concepts, and/or make other significant contributions to space science (reference <http://explorers.gsfc.nasa.gov/index.html>). The Explorer program is open only for investigations that study the Sun, the space environment of the Earth and other planets, and the universe beyond our Solar System. Proposals for instrumentation necessary to address the first two of these goals are appropriate for the SECID program.

- Solar Terrestrial Probes

The Solar Terrestrial Probe (STP) program science objectives are directly tied to the quests in the SEC theme and each mission responds to one or more of the following objectives:

- To describe the system behavior of the magnetic variable star, our Sun, and its interaction with the entire solar system;
- To understand the critical physics that link the Sun, Earth, and the interstellar medium; and
- To understand the boundary processes and dynamics of geospace, the electrical-plasma environment between the Sun and the Earth.

The science investigation instruments for the first three STP missions (TIMED, Solar-B, and STEREO) have already been selected, so instrument development for these missions may not be proposed for this SECID program. In addition, owing to the anticipated near-term release of an Announcement of Opportunity (AO) for science investigations for the

STP Magnetosphere MultiScale (MMS) mission, proposals for instrumentation relevant to this mission may not be proposed to this NRA. However, proposals are welcome for definition of instruments relevant to future STP missions envisioned in the SEC Roadmap 2003-2028, at http://sec.gsfc.nasa.gov/sec_roadmap.htm.

- Living With a Star

The primary objective of The Living With a Star (LWS) program is to “Define the origins and societal impacts of variability in the Sun-Earth Connection.” LWS is a research program targeted to understand the cause-and-effect relationships between events at the Sun and their effects—on life on Earth and humanity's technological systems (reference <http://lws.gsfc.nasa.gov/>). The mission categories envisioned for LWS include the Solar Dynamics Observatory (SDO), a Geospace Missions Network, and the Solar Sentinels. The science investigation instruments for SDO, the first LWS mission, has already been selected, so instrument development for this mission may not be proposed for this SECID program. In addition, owing to the anticipated near-term release of an Announcement of Opportunity (AO) for science investigations for the Ionosphere-Thermosphere Storm Probe component of the Geospace Missions Network (ITSP), proposals for instrumentation relevant to this mission may not be proposed to this NRA. However, proposals are welcome for definition of instruments relevant to subsequent LWS missions such as the Radiation Belt Storm Probe component of the Geospace Missions Network (reference the Geospace Mission Definition Team Report at http://lws.gsfc.nasa.gov/lws_presentations.htm#geospace), as well as intermediate LWS missions and other missions as envisioned in the document *SEC Roadmap 2003-2028* and located at http://sec.gsfc.nasa.gov/sec_roadmap.htm.

3. Programmatic Information

Proposals are solicited under this NRA for instrument definition and development only for the missions or classes of missions described in Section 2 above. All proposals submitted to the SECIDP program must specify the science objectives of the proposed instrumentation. The relationship between the science objectives and the instrumental capabilities must be clearly demonstrated. For those instruments applicable to many missions or capable of meeting multiple science objectives, examples of science objectives for the proposed mission or missions must be given.

It is anticipated that the scientific payloads on most future Sun-Earth Connection missions will be limited to small, low mass, low power consumption, and low cost instruments. Therefore, proposals for instrument definition and development satisfying these general specifications are especially solicited. Proposals should clearly demonstrate what technical advances would result (e.g. instrument sensitivity, resource requirements, survivability) and what new science might be enabled relative to current instrumentation, if funded.

It should be noted that the contemplated sequence of missions described in this NRA is a best current estimate and is subject to change. NASA reserves the right to make a determination of relevance based on the contemplated sequence of missions, as it is understood at the time of proposal evaluation and selection.

Proposals may specify periods of performance of up to three years. It is expected that there will be approximately \$1.5M available in Fiscal Year 2004 to support on the order of 10 new investigations.

IMPORTANT INFORMATION

- As discussed in the *Summary of Solicitation* of this NRA, the Office of Space Science (OSS) now uses a unified set of instructions for the preparation and submission of proposals given in the document entitled *NASA Guidebook for Proposers Responding to NASA Research Announcement - 2003* (or *NASA Guidebook for Proposers* for short) that may be accessed by opening <http://research.hq.nasa.gov/> and linking through "Helpful References," or by direct access at <http://www.hq.nasa.gov/office/procurement/nraguidebook/> (note that the updated 2003-edition of the *Guidebook* is used for this solicitation).
- Section 6 of this NRA's *Summary of Solicitation* contains the Web address relevant to the electronic submission of a Notice of Intent (NOI) to propose and a proposal's *Cover Page/Proposal Summary/Budget Summary*, as well as the mailing address for the submission of the hard copies of a proposal.

Questions about this program element may be directed to the cognizant Program Officers:

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